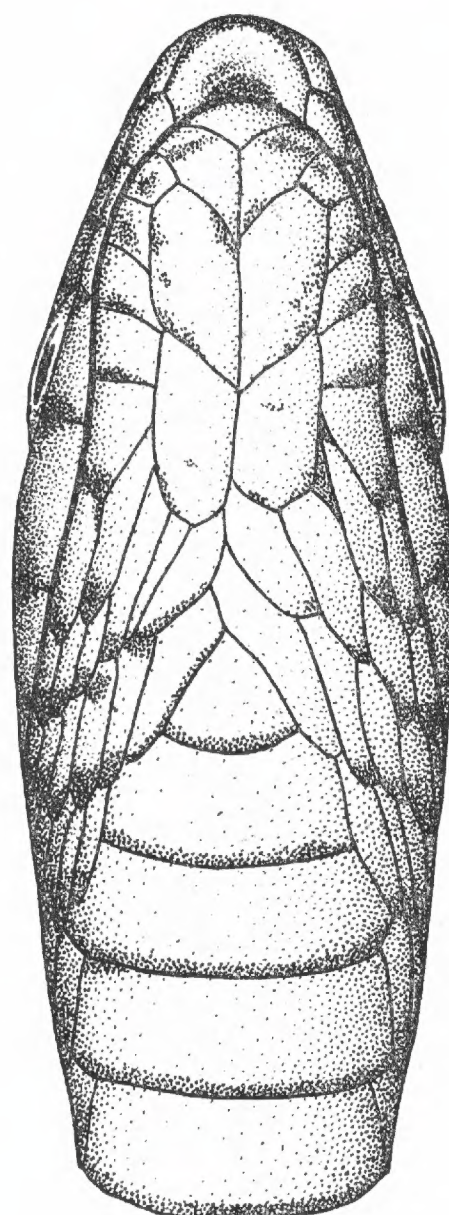
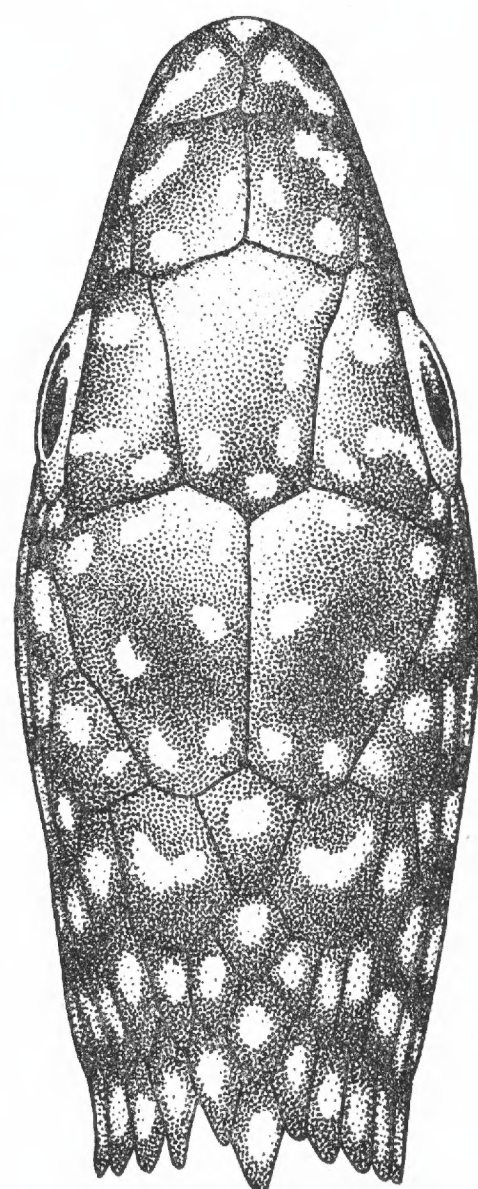
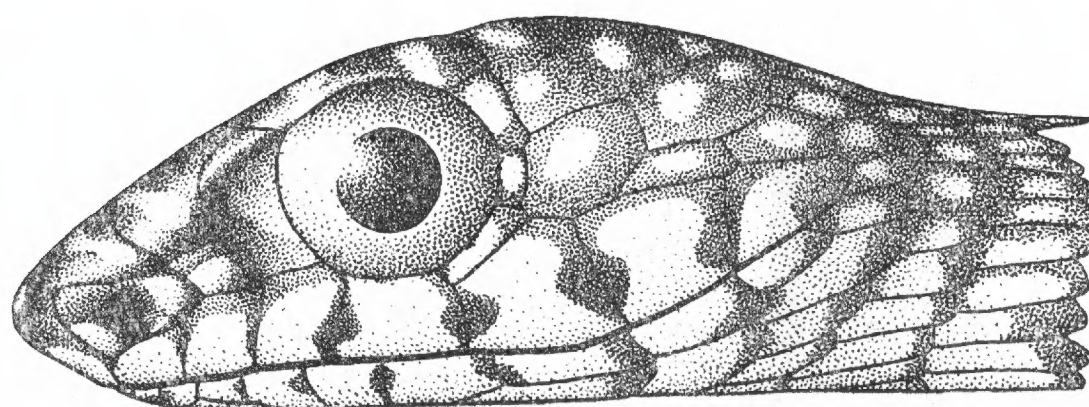

BULLETIN

of the

Chicago Herpetological Society



Volume 52, Number 9
September 2017



BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY

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The Bulletin of the Chicago Herpetological Society (ISSN 0009-3564) is published monthly by the Chicago Herpetological Society, 2430 N. Cannon Drive, Chicago IL 60614. Periodicals postage paid at Chicago IL. **Postmaster:** Send address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago IL 60614.

Feeding Activity of an Eastern Hog-nosed Snake Immediately after Radio-tracking

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The use of radio-telemetry to study the ecology and natural history of snakes is of paramount importance because snakes are cryptic and hard to recapture (Steen, 2010; Durso et al., 2011; Riley et al., 2017). This technique is widely used and generally does not significantly impact the ability of a snake to carry out normal life history functions (e.g., Burger and Zappalorti, 2011). However, the downsides may include lower growth and survival, because of either direct effects, such as infection, or indirect effects, such as observer disturbance (e.g., Weatherhead and Blouin-Demers, 2004).

At 1351 hr on 3 Aug 2012, as part of ongoing research at a popular state park in Saratoga County, New York, we used radio-telemetry to re-locate a small *Heterodon platirhinos* (Eastern Hog-nosed Snake; snout-vent length = 63.6 cm, mass =

120 g). This snake had been implanted with a 5-g SB-2 radio transmitter (Holohil Systems Ltd., Carp, Ontario, Canada) by an experienced veterinarian at the Greenfield Animal Hospital (Greenfield Center, New York, USA) following the procedure described in Reinert and Cundall (1982). To prevent infection and undue pain, the snake was administered antibiotics (Enrofloxacin) and painkillers (Meloxicam) at doses based on body weight and determined by the veterinarian. For further methods and spatial ecology of snakes from this population, see Vanek and Wasko (2017).

As one of us (JV) homed in on the snake's location, our presence startled the snake which fled ~2 m before stopping. We stayed motionless at the snake's original location, and 3 min later observed the snake catch and consume an adult *Anaxyrus americanus* (American Toad) that was previously unnoticed and hidden in the leaf litter. The *H. platirhinos* consumed the *A. americanus* in less than 2 min, and then slowly crawled away while seemingly indifferent to our presence. This observation suggests that the indirect effects of radio-telemetry (i.e., disturbing the animal upon locating it) on *H. platirhinos* may be minimal, as the snake clearly recovered from our intrusion within a short period of time and there was no apparent deviation from the snake's normal movements (Figure 1).

Acknowledgments

This work was supported by funding provided by the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) and administrated by Casey Holzworth, who also helped develop the underlying protocol. This study was conducted under permits from the DEC (#1512) and OPRHP (#2012-MLSP-002), and the animal welfare protocol was approved by the Environmental Management Bureau in association with the OPRHP permit (#2012- MLSP-002).

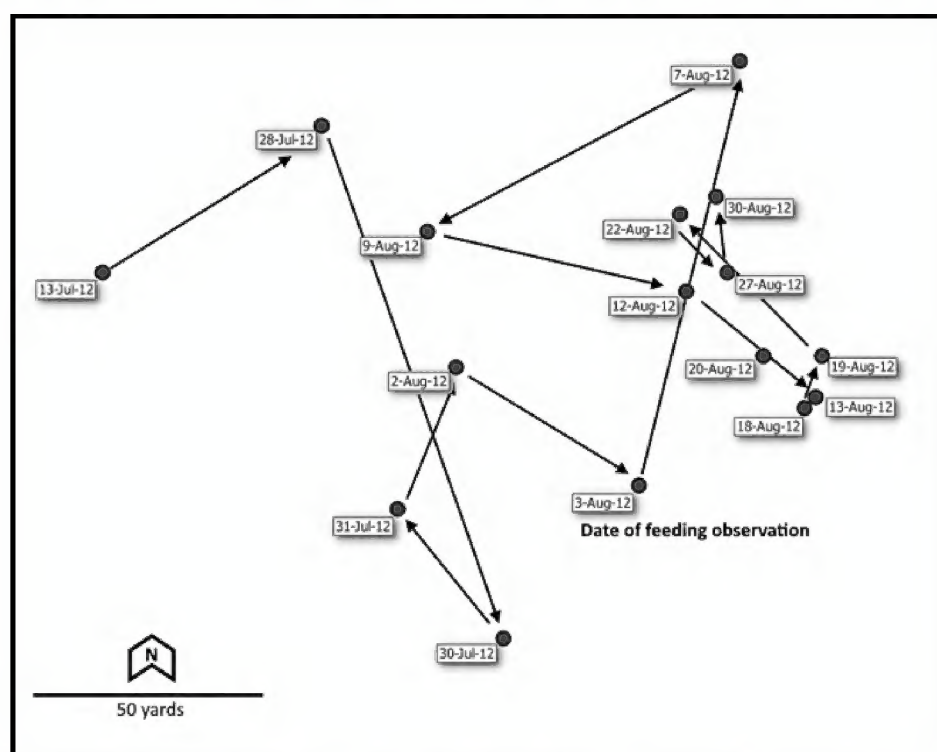


Figure 1. Movements during July and August (2012) of a female Eastern Hog-nosed Snake (*Heterodon platirhinos*) in Saratoga County, New York, as determined by radio-telemetry.

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How Rattlesnakes “Do it”

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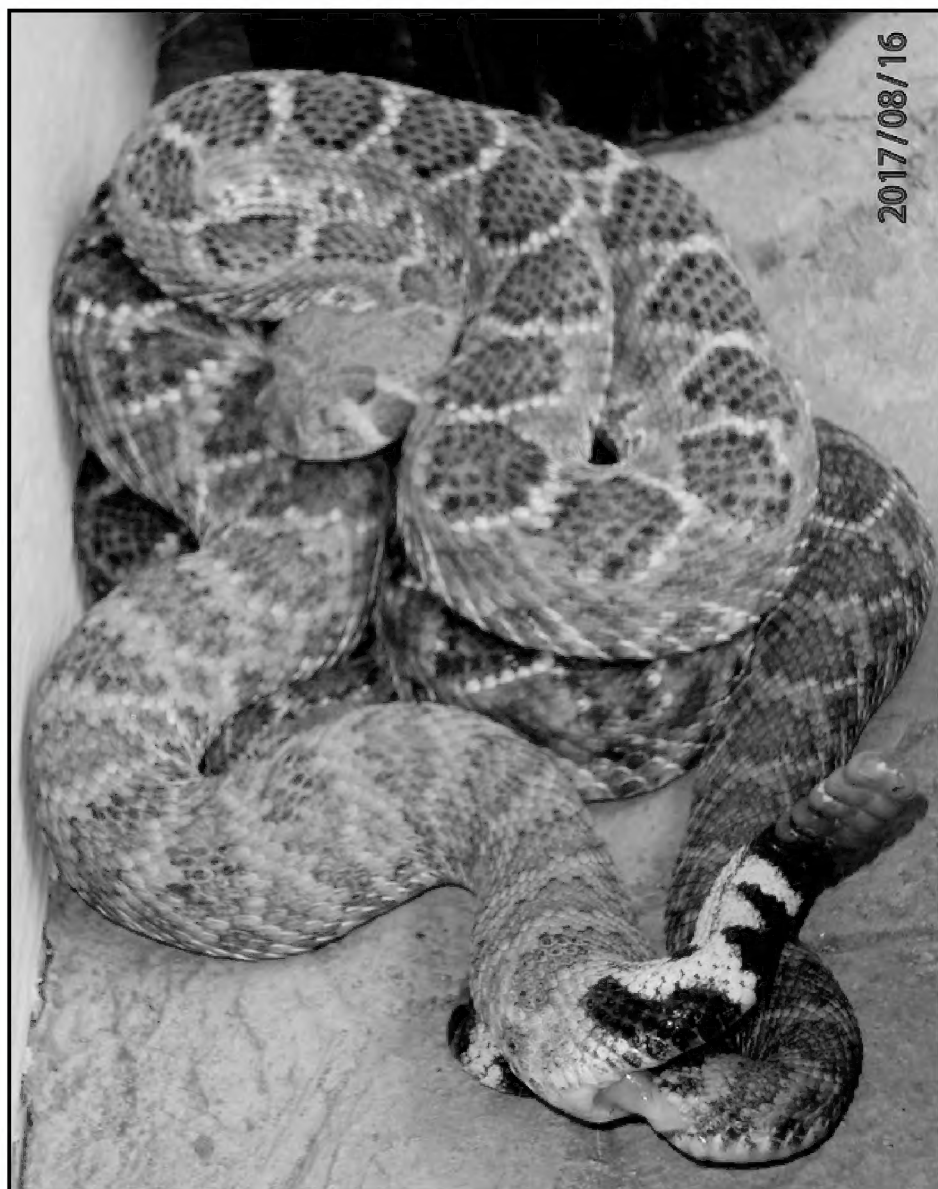
It was nothing new when a neighbor called and asked me to remove a rattlesnake from her premises. But to discover not just one, but TWO western diamondbacks—and they were copulating on her back porch—THAT was new! In my decades of collecting / apprehending live rattlesnakes I had not seen this behavior before except (rarely) in zoos. I grabbed my camera, then quickly focused and shot some pictures of this seldom-witnessed event. Besides the clear and graphic image of the two snakes locked together, we can see the highly agitated female on top, ready to strike while the male is coiled quietly beneath her.

Among snakes, like other terrestrial vertebrates, reproduction begins via internal fertilization. So, how do they do it? They have no arms or legs, which requires extraordinary modifications in both anatomy and behavior to get their genes into the next litter of baby snakes. First, instead of a single intromittent

organ like other animals, male snakes (and lizards as well) possess a pair of organs known as hemipenes (singular = hemipenis). Both organs are divided and studded with spines in order to maintain internal grip (and prevent premature withdrawal) once implanted inside the female’s cloaca. (Note: a cloaca is an internal reservoir characteristic of both sexes at the aft end of the body into which wastes are deposited prior to being expelled. Likewise, baby rattlesnakes, in their protective transparent membrane, pass through the cloaca when born). Second, the female must be willing and compliant. If she is not, the male has no alternative except to continue with his courtship consisting of tongue-flicking along the female’s back and head. Once coupled, the pair will remain locked together from between 1 hour to 2 days. During that time, they remain quietly in place unable to go their separate ways. In fact, for a zoo man trying to transfer two diamondbacks thus connected, into a carrying bag without injuring either of them was another “first.”

With the snake transfer completed, the bag with the two quiet snakes was placed carefully in my reptile room for the night to give them a chance to separate. Although I was greeted with two uncoupled rattlesnakes the next morning, they were highly agitated as I transferred them to their permanent individual quarters.

Here are some answers to frequently-asked rattlesnake questions: From 6 to 65 babies (sometimes more) are born every one or two years (the average is approximately 20). Young are typically born sometime between spring (May-ish) and late summer. Precocial, the young are fully prepared to make their own living without any maternal support. They can even deliver a toxic bite prior to their emergence into the world, if their protective membrane is touched next to the tiny head by a curious finger. Babies are noiseless although they have a button on their tail. After their first skin-shed shortly after they are born, they will add the first segment to their rattle and a faint bit of noise can be heard. Prior to hibernation the babies will try to find their way to their mother’s den by following the scent trails of her or other rattlesnakes in the fall. Can a male rattlesnake mate with two females—one on either side of the male—simultaneously? Theoretically, yes but in the real world that would be terribly risky for the male if the females decided to go their separate ways. And yes, like all babies they have big eyes and are cute—kinda.



Reproduction in Gulf Coast Toads, *Incilius nebulifer* (Anura: Bufonidae) from Texas

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Abstract

A histological examination of gonads of 43 Gulf Coast toads, *Incilius nebulifer*, from Texas was conducted. The smallest mature male (sperm in lumina of seminiferous tubules) measured 50 mm SVL and was from March. The smallest mature female (spawning condition) measured 60 mm SVL and was from April. Follicular atresia was noted in 3/16 (19%) of females. Males are capable of breeding from January into autumn. Females of *I. nebulifer* are in spawning condition from February into August. As was the case for other anurans from the southwestern United States that are not exposed to prolonged periods of freezing temperatures, *I. nebulifer* has an extended period of reproductive readiness. Breeding may occur at any time suitable moisture conditions prevail.

Incilius nebulifer (Girard, 1854) ranges from north-central Texas to southern Arkansas and eastern Louisiana south to central Veracruz, Mexico (Tipton et al., 2012). In this paper I present data from a histological examination of gonadal material from Texas. Information on *I. nebulifer* (as *Bufo nebulifer*) reproduction is in Wright and Wright (1949), Blair (1953, 1960), Dundee and Rossman (1989), Mendelson (2005). Utilization of museum collections for obtaining reproductive data avoids removing additional animals from the wild.

A sample of 43 *I. nebulifer* collected 1938 to 1976 from Texas (Appendix) consisting of 24 adult males (mean snout-vent length, SVL = 67.5 mm ± 9.6 SD, range = 50–92 mm), 16 adult females (mean SVL = 78.4 mm ± 13.2 SD, range = 60–106 mm) and three subadults with SVLs of 35, 41, 48 mm was examined from the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, USA (Appendix). An unpaired *t*-test was used to test for differences between adult male and female mean SVLs (Instat, vers. 3.0b, Graphpad Software, San Diego, CA).

A small incision was made in the lower part of the abdomen and the left testis was removed from males and a piece of the left ovary from females. Gonads were embedded in paraffin, sections were cut at 5 µm and stained with Harris hematoxylin followed by eosin counterstain (Presnell and Schreiber, 1997).

Histology slides were deposited in LACM.

The testicular morphology of *I. nebulifer* is similar to that of other anurans as described in Ogielska and Bartmanska (2009a). Within the seminiferous tubules, spermatogenesis occurs in cysts which are closed until the late spermatid stage is reached; cysts then open and differentiating sperm reach the lumina of the seminiferous tubules (Ogielska and Bartmanska, 2009a). Monthly stages in the testicular cycle of *I. nebulifer* are in Table 1. The spermatogenic cycle was classified into two stages: (1) sperm mainly in open cysts, i.e., most, but not all sperm was in open cysts; (2) sperm mainly in lumina of the seminiferous tubules, although some sperm remained in open cysts. *Incilius nebulifer* males in either stage are capable of breeding. The smallest mature male in my study measured 50 mm SVL (LACM 65291) and was collected in March in Hays County. According to Wright and Wright (1949) *I. nebulifer* males reach maturity at 53 mm SVL. However, Blair (1953) reported a 44 mm SVL male adult *I. nebulifer*.

The mean SVL of *I. nebulifer* females was significantly larger than that of males (*t* = 3.04, *df* = 38, *p* = 0.004). The ovaries of *I. nebulifer* are typical of other anurans in being paired organs lying on the ventral sides of the kidneys which in adults are filled with diplotene oocytes in various stages of development (Ogielska and Bartmanska, 2009b). Mature oocytes are filled with yolk droplets; the surrounding layer of

Table 1. Two monthly stages in the testicular cycle of 24 adult *Incilius nebulifer* males from Texas.

Month	N	(1) Sperm mainly in cysts	(2) Sperm mainly in lumina
January	1	1	0
March	2	0	2
April	7	1	6
May	4	3	1
June	7	3	4
July	1	1	0
September	1	1	0
November	1	0	1

Table 2. Monthly stages in the ovarian cycle of 16 adult *Incilius nebulifer* females from Texas.

Month	N	(1) Ready to spawn	(2) Not in spawning condition
February	2	1	1
March	2	2	0
April	7	7	0
May	1	1	0
June	1	1	0
August	2	2	0
October	1	0	1

follicular cells is thinly stretched. Monthly stages in the ovarian cycle of *I. nebulifer* are in Table 2. Two stages were present: (1) “Ready to spawn” in which mature oocytes predominated; (2) “Not in spawning condition” in which early diplotene oocytes were most abundant. Fourteen of 16 (88%) *I. nebulifer* females were ready to spawn (Table 2). This indicates the great majority of *I. nebulifer* females are capable of spawning during the above ground part of their activity cycle. The one female from February in Stage 2 “Not in spawning condition” contained diplotene oocytes that had not commenced yolk deposition; she had not yet joined the breeding population. Its follicles would have presumably matured later in the year. The one female from October (Table 2) in Stage 2 contained yolk-filled oocytes that were smaller than those in stage 1 “Ready to spawn” females and were similar to Secondary Growth Stage 5 “progressive accumulation of yolk platelets” in Uribe (2011). It is not known if these smaller yolk-filled oocytes would have remained through the winter and matured in the following year or if they would have undergone atresia. The smallest mature female (spawning condition) measured 60 mm SVL (LACM 106902) and was collected in April. Maturity was reached at 54 mm SVL for females of *I. nebulifer* (Wright and Wright, 1949). Blair (1953) reported an adult *I. nebulifer* that measured 53 mm SVL. Ovaries of two smaller females in my study (LACM 65296, SVL 48 and LACM 88428, SVL 41 mm) contained immature oocytes and were considered to be subadults. One smaller *I. nebulifer* (LACM 76540, SVL = 35 mm) contained tiny gonads and was not sexed.

Occasional atretic follicles were noted in 3/16 (19%) of the *I. nebulifer* ovaries examined. Atresia is a widespread phenomenon occurring in the ovaries of all vertebrates (Uribe, 2009). It is common in the amphibian ovary (Saidapur, 1978) and is the spontaneous digestion of a diplotene oocyte by its own hyper-

trophied and phagocytic granulosa cells which invade the follicle, and eventually degenerate after accumulating dark pigment (Ogielska and Bartmanska, 2009b). It is not known why some oocytes continue development until ovulation while others undergo atresia (Saidapur, 1978). Incidences of follicular atresia increase late in the reproductive cycle (Goldberg, 1973). Saved energy will presumably be utilized in a future reproduction. One *I. nebulifer* female with atresia (LACM 65295) was from August, late in the *I. nebulifer* activity cycle. The other two *I. nebulifer* females with atretic follicles were from earlier in the activity cycle (LACM 106909) from March, and (LACM 88434) from May. High levels of follicular atresia can reduce the spawning mass (Goldberg, 2016a) or remove females from the breeding population (Goldberg, 2017).

Breeding of *I. nebulifer* (as *Bufo valliceps*) may occur from March or April to August and peaks in May but may be curtailed without sufficient rainfall (Blair, 1960). *Incilius nebulifer* reproduce in Louisiana from March to September (Dundee and Rossman, 1989). Wright and Wright (1949) reported breeding occurred from March to August. According to Tipton et al. (2012) *I. nebulifer* can breed from February to September after heavy rainfall and reproduce in a variety of aquatic habitats, both temporary and permanent.

In conclusion, as is the case for other anurans from the southwestern United States (Goldberg, 2015, 2016a, b, 2017) that are not exposed to extended periods of freezing temperatures, *I. nebulifer* has an extended period of reproductive readiness with ripe gonads so that breeding may occur at any time, should suitable conditions of moisture prevail.

Acknowledgment

I thank Gregory B. Pauly (LACM) for permission to examine *I. nebulifer*.

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Appendix

Incilius nebulifer examined by county from Texas borrowed from the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, USA. **Bastrop**, LACM 65295, 106900; **Bexar**, LACM 88428, 106909; **Brazos**, LACM 1176, 1177; **Calhoun**, LACM 64155, 64157; **Chamber**, LACM 65305; **El Paso**, LACM 65296, 65298; **Gregg**, LACM 1179; **Harris**, LACM 65299 ; **Hays**, LACM 65291, 65293, 65294; **Hidalgo**, LACM 64160, 64161; **Jackson**, LACM 105732; **Kendall**, LACM 125388, 125389, 125390, 125391, 125392; **McLennon**, LACM 88432, 84433; **Menard**, LACM 65303, 65304; **Orange**, LACM 64154, 64523; **Travis**, LACM 88434, 88435, 106905, 106907, 106908; **Tyler**, LACM 106902, 106903, 106904, **ValVerde**, LACM 64165, 88438; **Washington**, LACM 76540; **Willacy**, LACM 64159.

Book Review: *Amphibians and Reptiles of the Great Lakes Region* (Revised Edition)

by James H. Harding and David A. Mifsud

2017. xvi + 392 pp. University of Michigan Press, Ann Arbor, Michigan.

Hardcover US \$60.00 ISBN 978-0-472-07338-2 Softcover US \$24.95 ISBN 978-0-472-05338-4

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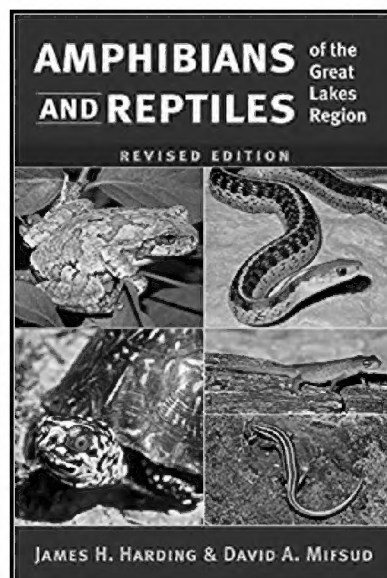
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It has been approximately 20 years since the initial publication of *Amphibians and Reptiles of the Great Lakes Region* (Harding, 1997), a volume many, including myself, have read, re-read, consulted and cited countless times. For those of us who reside in the Great Lakes region it could even be considered our herpetological “bible.” When I was made aware that a revised edition was in the works, the anticipation was reminiscent of my childhood, when I would anxiously await Christmas gifts. Unfortunately, some gifts turned out to be utterly disappointing. Does the revised edition of *Amphibians and Reptiles of the Great Lakes Region* by James Harding and David Mifsud disappoint?

The attractive hard cover contains representative images of each of the five major groups of amphibians (i.e., frogs and salamanders) and reptiles (i.e., snakes, lizards and turtles) found in the Great Lakes region. The binding appears solid, although I do not know if it would handle the rigors of being repeatedly taken into the field. After excessive handling, the front endpaper and first signature has become slightly loose at the top of my copy. Like the first edition, the book is divided into three sections: 1) a general introduction to herpetology; 2) a discussion of the region’s major groups of amphibians and reptiles, including the individual species accounts; and 3) resources. Compared with the first edition (Harding, 1997), the revised book has an additional 14 pages, primarily the result of nearly 90 additional color images. Eleven line-drawings (Figures 1–11) of primarily anatomical characters supplement the text. For example, Figure 5 (page 38) illustrates the costal grooves, naso-labial grooves and cirri that are present in some salamanders.

In the first section, “Introduction to Herpetology” (pp. 1–36), the authors “consider the defining attributes, paleohistory, and taxonomy of amphibians and reptiles . . .” and also discuss the role of herps in ecosystems, their interactions with people, and conservation. The summary of the effects of past glaciation on the distribution of the region’s amphibians and reptiles is informative and helps the user of the book better understand why species occur where they do. A checklist and suggestions regarding when and where to seek amphibians and reptiles is also present. Closing the first section of the book is an educational confab regarding venomous snakes, preventing snakebite, and advice on what to do if snakebite occurs.

The bulk of the book is in the second section (pp. 37–358), with in-depth individual accounts of 33 amphibians and 37 reptiles known to occur in the Great Lakes region, followed by brief accounts of ten marginal and questionable species (pp. 359–369). Included in the species accounts are descriptions of



the identifying characteristics of juveniles and adults, and where pertinent, differences between sexes. The species accounts are well penned and furnish the reader with a wealth of information on habitat preferences, behaviors, diet, predator and prey interactions, seasonal activity, reproduction, longevity, and plenty more. Each account contains one to four color images, with the majority (58) having two. The images, approximately 162 in all, are mostly above average and depict various life stages, diagnostic characteristics, color and pattern variations, and behaviors. Only about 10 images were recycled from the first edition. The combination of the images and text should allow the user of the book to identify most specimens.

However, in my experience, the images for the Northern Dusky Salamander, *Desmognathus fuscus* (p. 83), and the Allegheny Mountain Dusky Salamander, *D. ochrophaeus* (p. 87), do not represent typical specimens of either species in the region south of Lake Erie. The image of *D. fuscus* in Harding (1997) is more typical. In *D. ochrophaeus*, the pattern usually consists of a dark bordered straight-edged light dorsal stripe with a mid-dorsal row of dark chevron-like markings (Powell et al., 2016). In older individuals that have darkened to the point of obscuring the pattern, one can usually use the shape of the tail, keeled in *D. fuscus* and rounded in *D. ochrophaeus* to differentiate the species. However, occasionally one comes across specimens with characteristics intermediate between *D. fuscus* and *D. ochrophaeus*. If these two species do hybridize in the Great Lakes region, as the authors note is suspected, that would partly explain the occurrence of individuals that defy simple identification. In the account for the Northern Ravine Salamander, *Plethodon electromorphus* (pp. 95–98), an image of the ventral surface would facilitate separating this species from the Eastern Red-backed Salamander, *P. cinereus*.

As part of the descriptions “each species’ size is given as a range, usually the minimum size at sexual maturity to the maximum known size . . .” For nearly two dozen species the maximum size could have been updated. Unless otherwise stated I consulted Powell et al. (2016) to verify species maximum sizes. Known maximum sizes are: Western Lesser Siren, *Siren intermedia nettingi* (p. 43), 68.6 cm; Small-mouthed Salamander, *Ambystoma texanum* (p. 66), 19.1 cm; Marbled Salamander, *A. opacum* (p. 70), 13.6 cm; Four-toed Salamander, *Hemidactylium scutatum* (p. 98), 11.3 cm; Bullfrog, *Rana catesbeiana* (p. 144), 22 cm (Dodd, 2013); Eastern Musk Turtle, *Sternotherus odoratus* (p. 180), 15 cm; Spotted Turtle, *Clemmys guttata* (p. 185), 14.3 cm; Eastern Box Turtle, *Terrapene carolina* (p. 201), 23.5 cm; Blanding’s Turtle, *Emydoidea blandingii* (p. 208), 28.4 cm;

Red-eared Slider, *Trachemys scripta elegans* (p. 224), 30.2 cm (Tucker et al., 2006); Eastern Spiny Softshell, *Apalone spinifera* (p. 230), 54 cm female and 31 cm male; Five-lined Skink, *Plestiodon fasciatus* (p. 238), 22.2 cm; Common Water Snake, *Nerodia sipedon* (p. 261), 150 cm (Gibbons and Dorcas, 2004); Queen Snake, *Regina septemvittata* (p. 271), 92.2 cm (Gibbons and Dorcas, 2004); Kirtland's Snake, *Clonophis kirtlandii* (p. 275), 66.2 cm; Short-headed Garter Snake, *Thamnophis brachystoma* (p. 289), 57.8 cm (Lethaby, 2004); Plains Garter Snake, *T. radix* (p. 291), 109.2 cm (Rossman et al., 1996); Northern Red-bellied Snake, *Storeria o. occipitamaculata* (p. 306), 42.2 cm (Gray and Lethaby, 2008a); Smooth Green Snake, *Opheodrys vernalis* (p. 309), 79.7 cm; North American Racer, *Coluber constrictor* (p. 313), 190.5 cm; Eastern Hog-nosed Snake, *Heterodon platirhinos* (p. 340), 126.8 cm; Plains Leopard Frog, *R. blairi* (p. 362), 11.4 cm (Dodd, 2013); Yellow Mud Turtle, *Kinosternon flavescens* (p. 364), 16.8 cm. There are several other species (e.g., Eastern Milk Snake, *Lampropeltis triangulum*) where the stated maximum sizes are off by 0.1–0.2 cm, likely the result of converting the measurements from inches to centimeters, then rounding. A lack of citations for natural history information, such as longevity and size, makes it difficult to verify the stated values. While not a critical concern, problems may arise when such unsubstantiated “facts” are cited by others (Moriarty, 1998).

The maps are a substantial improvement of those in the first edition, showing counties (US) and census divisions (Canada), making interpreting a given species' distribution a facile task. A smaller map inserted into the upper left depicts the species' overall North American distribution. It is stated by the authors that “the range maps are provided as a guide to the historical distribution of amphibians and reptile species in the Great Lakes basin . . .” (p. ix). There are several instances where the text and or maps could have been adjusted to corroborate current knowledge. For example, in the account for the Blue-spotted Salamander (*A. laterale*), the text states that the species is listed as endangered in Ohio and Pennsylvania (p. 59), however the corresponding map (p. 60) does not illustrate any distribution in Pennsylvania. This could have been done to keep the locality secret in an attempt to protect it from unscrupulous collectors. The distribution map for the Jefferson Salamander, *A. jeffersonianum* (p. 64) does not include Erie County, Pennsylvania, where the species is known to occur within the Lake Erie drainage (Hulse et al., 2001; Bogart and Klemens, 2008). The range for the Northern Spring Salamander, *Gyrinophilus p. porphyriticus* (p. 102) could have been extended into the Lake Erie Drainage of eastern Erie County (Gray and Lethaby, 2008b, 2012). The mapped distribution of the Midland Chorus Frog, *Pseudacris triseriata* (p. 130) includes all of Crawford and Erie Counties in Pennsylvania, yet there are no literature or museum records that would support this (McCoy, 1982; Hulse et al., 2001; Gray and Lethaby, 2008b). The distribution map of the Wood Turtle, *Glyptemys insculpta* (p. 192) includes portions of extreme southeastern Ashtabula and eastern Trumbull Counties, Ohio. Yet, no mention is made in the text of Wood Turtles in Ohio. It could have been noted that the status of the Wood Turtle in Ohio is undetermined. In the account for the Eastern Box Turtle (p. 204) it is stated that the species “also occurs in Erie County, Pennsylvania . . .” This is in contrast to others who note that Eastern Box Turtles do not occur in Erie County,

Pennsylvania (Hulse et al., 2001; Wilson, 2010). Although occasional specimens do turn up in Erie, most have been at Asbury Woods Nature Centre and Presque Isle State Park, sites where unwanted pet turtles are occasionally dropped off (Gray and Lethaby, 2008b, 2012). Such turtles usually exhibit behaviors and or morphology that is more typical of previously captive individuals. With that being said, I cannot totally disprove the authors' statement that some occurrences of Eastern Box Turtles from areas where they were thought to be extirpated, could represent the last vestiges of formerly natural populations. Regarding the distribution of the Short-headed Garter Snake, *T. brachystoma* (p. 290), mention is made of the species' occurrence in Youngstown, Ohio. However, no mention is made of the species' presence in Trumbull County, Ohio; although it is illustrated on the map (p. 288). Furthermore, the range of the Short-headed Garter Snake in the Lake Erie Drainage in Erie County, Pennsylvania, could have been extended to within 1.5 km of the Ohio border where a population has been known for at least a decade (Gray, 2005).

The natural history information provided in each account is both extensive and fascinating. There were only a couple spots where my nit-picking tendencies were aroused. The statement that all snakes “must swallow prey animals whole” (pp. 257–258) is not totally correct. As mentioned by the authors in the Dekay's Brown Snake, *S. dekayi* (p. 303) and Northern Red-bellied Snake (p. 308) accounts, these snakes have specialized teeth and jaws that allow them to pull a snail out of its shell. Thus, these snakes do not always swallow their prey whole. Furthermore, two species of homolopsine snakes, Gerard's Water Snake, *Gerarda prevostiana*, and the Crab-eating Snake, *Fordonia leucobalia*, dismember crabs while consuming them (Jayne et al., 2002). The stated litter size (4 to 15) for the Short-headed Garter Snake (p. 291) could have been updated; two litters from Erie County, Pennsylvania, contained 16 and 17 neonates (Lethaby, 2011).

The third section “Resources” (pp. 371–378) includes more titles (129) than the first edition (102). Missing from the revised edition are three titles featuring recordings of frog and toad vocalizations. I'm guessing that they were removed because the original formats (i.e., vinyl LP, cassette, or compact disk) are now somewhat obsolete. However, at least one, *Sounds of North American Frogs* is available for purchase as a download from Smithsonian Folkways (<http://www.folkways.si.edu/sounds-of-north-american-frogs/science-nature/album/smithsonian>). Alternatively, a link to an online resource, such as the USGS Frog Quiz site (United States Geological Survey, 2017) could have been provided. A list of national/international (American Society of Ichthyologists and Herpetologists, Herpetologists' League, and Society for the Study of Amphibians and Reptiles), and regional (Chicago Herpetological Society) herpetological societies and their respective publications are supplied. Missing, however, are the web addresses for these societies. While it is not too difficult to locate each society's website online, including the web addresses seems like it would have been useful. A sufficient glossary of 126 select terms (pp. 379–383) and a combined index to subjects, as well as common and scientific names (pp. 385–392) close out the book.

There are only a few inconsequential typographical or omission errors in the book. In justification of the authors' use of

Rana in place of *Lithobates*, they cite Yuan et al. (2016) (p. 10), but failed to include the citation in the resources. On page 35 the word “be” is missing “in rare cases it may [be] reasonable to kill the snake . . .” On page 38, in the last paragraph there is a superfluous semicolon after the date 1943, likely the result of deleting the citation for Conant and Collins (1991) that was in the first edition. In the Spotted Turtle account under the subsection “Distribution and Status” (p. 186) the word “are” is apparently missing from the second half of the first sentence. It should read: “but there [are] two primary areas of occurrence.” On page 260 “Duvernoy” is misspelled “Duvernay,” but it is spelled correctly on page 282. Some omission errors were inherited from the first edition. For example, on page 326 a period is missing after “swallowing.” On page 368, “cm” is missing after “maximum total length 119.4.” On the back cover, the “H” is missing from

NOAH (Northern Ohio Association of Herpetologists).

So, should you invest your money and surrender valuable bookshelf space on the revised *Amphibians and Reptiles of the Great Lakes Region*? Absolutely! Harding and Mifsud have done an excellent job in providing a book that does not disappoint. Despite my criticisms, the plethora of new images, improved distribution maps, and comprehensive natural history information make this an excellent guide to the herpetofauna of the Great Lakes region. Furthermore, the book’s usefulness should appeal not only to those residing within the Great Lakes area, but also to anyone seeking to increase their knowledge of amphibians and reptiles.

My gratitude is extended to Gregory J. Lipps, Jr., for offering comments regarding this review.

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Udderly Creaming All Herpetological Bull Stories: The Great *Bos taurus* Transect

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Back in 1988, this author accidentally came upon a population of Sidewinders (*Crotalus cerastes*) less than 15 miles from his house. I had been living in Arizona for over seven years when that first one crossed the road in front of me. It was to date the biggest and most pleasant surprise to come from a place that is full of big and pleasant surprises. As soon as the first one was found, it became a mission of sorts for me to find a way to score large numbers of them. At least once a week or more, from 1988 to 1998, I hoofed all over the flats that contained them. I eventually learned where Sidewinder Central seemed to be located, and focused on that area. Consistency of effort became important, as any good scientist will tell you that just going out and finding herps is not good enough to prove anything. But my real purpose in seeking Sidewinders did not necessarily involve conforming to the rigid demands of science, but rather, drinking beer in a peaceful setting while finding cool herps. Necessity became the mother of invention, and the four-beer transect was created.

The pure but simple genius of the four-beer transect has never caught on in other circles. The notion of hiking slowly while drinking a beer until it is gone, turning right and drinking the next one, turning right again, drinking the next one, and lastly, turning right and drinking the last one while returning to the vehicle appears to run counter to the notion of serious science in the minds of lesser beings. But this herper can assure the reader that the most exciting herpetological discoveries ever made, if they really happened, occurred during these beer transects of mine. One of my discoveries is that during a severe drought, any surface water to suddenly appear anywhere is a major attraction to wildlife. For example, I was once out grinding in June of 1997, and finding absolutely nothing. June of '97 was at the tail end of the worst drought in the history of southern Arizona. Not even an insect could be found surface active. On this fateful night, the buildup of three 12-ounce bottles of Miller Highlife inspired my bladder and other associated body parts to create a rather substantial puddle along the jeep trail that I was following. As soon as the splatter began peppering my boots, there were two disturbances in the ground before me, and a pair of one inch-long stink bugs emerged from the soil. They both hastily ambled over to the ever-growing pool, and thrust their proboscises inside the same, aiming their shiny black backsides shamelessly skyward in the process. They drank lustily of the contents for quite a while, and stayed with it even as the puddle began to dry (Figure 1).

In times of lean, or times of plenty, the place I named "The 'Winder Spot" became my favorite stomping grounds. And for the first ten years, I had the place entirely to myself because, from 1988 to early 1998, the 'Winder Spot was without cattle. For ten blessed years, the place was as pristine a patch of ground as could be found anywhere. It was a fools' paradise. Indeed, even though I always parked next to an old saguaro-ribs-strung-with-barbed-wire corral to begin and end my beer transects, my underestimation of the carrying capacity of the land had me

believing that there was no way that cattle production could be feasible. And then came the wonderfully wet fall of 1997, followed by the generous rains in the winter of 1998. The 'Winder Spot burst forth in a riot of plant life, the likes of which I had never seen. And then, in February of 1998, I pulled into my parking spot by the corral to see nearly a hundred cattle gathered within and around the framework of said corral. The spot, which had been so inspiringly serene just three days previous, was instantly transformed into a cesspool. The smell of urine was overpowering. The soft soil was already stomped into meandering furrows that wound around and through the vegetation. The washes where I so diligently sought snake tracks were churned and blasted by hoof prints. And it goes without saying, in addition to all this, the ground was gaily decorated with the bladder splatter of a non-stop cloacal onslaught. In three days flat, my own slice of paradise had morphed into a stinking stockyard.

The date that this happened was 14 February 1998. My notes have this to say of the occurrence: "For the first time ever, saw cattle at my 0.7 road parking spot. There were nearly a hundred, had to honk my horn to get through them. Saw perhaps a hundred more on Cattle Tank Road. This is absolutely tragic, the area was finally starting to look like it was recovering (from the great drought of 1997), and now the BLM allows introduction of cattle!! 0.9 Wash was churned with their hoofprints, the place is going to get hammered. I have been going to this area since 1988, the fact that there were no cattle here was the greatest asset the area had going for it. I am devastated that this is going down on my turf."

There's just no other view quite so breathtaking as the dung-stained south end of a northbound cow. As the poor dumbasses have no hands to wipe with, one might think they might have evolved to squat when they defecate, in order to keep from lining their inner thighs with their own excrement. Naw, it's just easier for them to poop all over themselves. Oh yeah, and then it dries there, leaving little dung puffballs of furry, unsightly dingle-berries for any observer witless enough to pay close

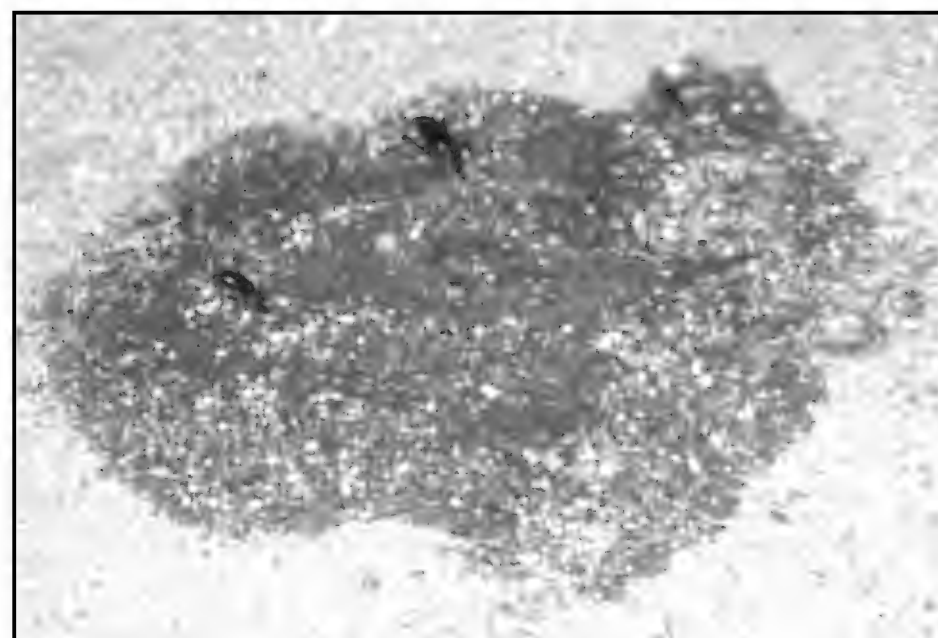


Figure 1. Two opportunistic Pinacate Beetles (aka "stink bugs") take full advantage of the sudden creation of a urine puddle during the great drought of 1997. The author hopes that they liked Miller High Life.

attention. Perhaps the only sight in nature to rival this is the full frontal look of these regal animals. The double-barreled, foot-long streamers of snot that dangle constantly out of their nostrils add to the disgusting ambiance of any cattle-viewing experience. And as often as not, the perennially stupid expression on their visages is accentuated by tasteful arrangements of cactus clumps, which hopefully serve as painful reminders of what *not* to try to eat. No kidding—I have seen the *idiots* walk right up to prickly pear cacti and start munching away. The spines go right through their lips, blood mingles with snot, they moan in their pain and misery and keep right on chewing anyhow. Jeez—what’s the sense in being stupid if you can’t prove it?

And so, in February of 1998, I pull into my normal parking spot and observe this grotesque scene a hundred times over—in a place where they have never been seen before. My spot, my place—besmirched by these things! Needless to say, there was no hot surge of joy running up and down my spine at the sight of them. My disposition turned into something resembling their ground splatter. I stepped out of my truck, and hollered: “Greetings, range maggots! *YOU SUCK!*” Following this curt announcement came a hail of rocks, sticks, logs—anything throwable that I could get my hands on. Seeing them flee in terror at my approach was to become a high point in my life. Eventually, the idiotic quadrupeds got the hint that when the Germanic biped who drove the white truck pulled in, it was time to leave. The cattle were left to roam out there for about a year. Eventually, they were hauled off for reasons unclear to me.

Good riddance! It was back to fresh air and the serenity that gives rise to inspiration and appreciation for all that is good with this world. And then came the very wet fall of 2000, and above average rain during the winter of 2001. Just when the land had begun to heal, in came the next batch. Once again, there were hundreds of them. Their arrival was noted with the same disdain as one might reserve for receiving a good dose of sexually transmitted disease. But this time, I decided to play nice. I was going to be at peace with the miserable, stinking, dung-eating lardasses. I was *not* going to let them ruin my life! As I stepped out of my brand new Toyota Tacoma pickup truck, the fresh arrivals crowded around me. They were all young ones, probably recently separated from their mother. They were friendly and curious—and almost cute. I had to gently push them out of my way to get to my backpack, and some even tried to follow me out on this first visit. This behavior was politely thwarted by a gentle stream of cuss words and a few well-aimed kicks.

I returned to my truck two hours later. They had surrounded it,

and all were lapping on it as if it was some sort of giant salt lick. I assume that they thought my tan-colored pickup truck was “mother,” and were seeking an udder to suck upon. They’re not exactly your world’s greatest thinkers. Prior to this orgasmic lick fest, the back of the tailgate of my *brand new* truck had silver plated, upraised letters that read thusly:

(Driver side) TOYOTA (Passenger side) Tacoma

What remained following the oral fixation of the tongue-wielding horde of cows was:

TO T coma

The idiots had devoured my “YO,” not to mention miscellaneous other letters. Thanks to these dumbasses, I was now driving a “TOT coma” (Figure 2).

(I was able to find one of the large, silver “O”s in a cow pie sometime later. I’m nourishing the hope that it came out broadside, thereby inflicting maximum damage to the colon prior to egress. If the idiot was constipated, all the better. In the end, I relish the notion that this was all a harsh lesson to teach that dimwit to be leaving future vehicular “YOs” alone.)

One night about six months later, I showed up for some after-dark herping. The cattle were all big now, and the nearby plants were all proportionately smaller. The cattle seemed especially friendly, and all gathered around as I arrived. When I began my walk, they insisted on following. This time, rather than the customary kicking and screaming to drive them off, I just decided to let them herp with me. Such was my “just-go-with-it” mentality at that point in time. At first, they were just a disorganized mob around me. This wouldn’t do! I stopped, turned to look them all in the eye, and spoke directly to them.

“OK, cows,” says I. “Half of you sorry asses break off and form a straight line to my left.” I don’t expect the well-educated readers of this column to believe what happened next, but I will recount it all accurately and truthfully anyhow. Just as sure as snot clings to my moustache, half of the cows formed a straight line to my left. Cows behaving well should always be encouraged.

“Good cows!”

Since looking them in the eye while speaking succinctly and directly to them seemed to be working, I continued with the practice. “Now, the other half of you—form a line to my right.” If you believe that half the cows formed a line to my left on request, neither should you doubt that the other half formed a perfectly straight line to my right. I couldn’t make this up on my best day!

“Ok cows, here’s the plan. You guys flank me. I want you in neat, orderly lines. I’m staying on this jeep trail.” One hundred stupid visages nodded their understanding in unison.

For the next mile, these YO-eating cows walked the most beautifully straight transect that I’ve ever seen. If herpers could walk this kind of transect, our herp numbers would skyrocket! If I stopped, the cows stopped. If I moved faster, the cows were right in step with me. When I moved slow, they moved slow. Fifty cows each to either side of me, all one meter apart, all doing exactly what I did, when I did it. What a proud sight it



Figure 2. The tailgate of the author’s pickup truck after young cattle ate some of the letters. See text for details.

must have been. Imagine Roger Repp, Herp King of Southern Arizona, leading one hundred cows on a perfectly orchestrated herp transect. As this was transpiring, my mind became a creative raging torrent on how to best make this pay off for me. I had them walking straight lines. Now, all I had to do was to get them to sound off when they found a snake. I was thinking along the lines of one moo for a colubrid, two moos for a rattlesnake. Once they were properly trained to do this, I'd start working on bovine snake identification with them. Short moo, long moo for a Mojave Rattlesnake. Two short moos for a Sidewinder. Two long moos for an atrox. Yup! It *could* work!

But all this deep thinking crashed and burned before it ever got off the ground. Suddenly, a pack of cows from the wrong side of the track were observed coming straight at me. These were big, bad, dumb and mean cows. Their sole purpose in life was to destroy my beautiful taurus transect, and this they proceeded to do with great efficacy. At their approach, I veered off the jeep road to do an end around on them. My transect completely fell apart, and my group circled in behind me and started to close in. Meanwhile, the new group of dumb and mean cows formed a circle in front of me. Malicious cows were closing in on me from all directions. As I swung my flashlight around for a better a look, their eyes glowed a demonic orange at me. This was getting spooky! Their intent was suddenly clear. They were obviously killer demon cows, who had cunningly lured me out into the middle of nowhere to do me in. I was a goner!

And then it hit me. Even though my thoughts were silent, a voice was screaming in my mind. The voice hollered: "Wait just a doggone minute here, Roger! You're a *man*, dammit! These are cattle, and they belong on *your* dinner plate. *Deal with 'em!*"

With that, I swung my walking staff into an arc that struck the ground. As the stick smacked the ground, I loudly uttered one word: "**GIT!**"

As it turned out, this act was highly effective, but proved to be a bit of overkill. The sudden action on my part set off an instant overreaction on theirs. They didn't even bother to turn around to flee in abject terror. Instead, their heads just shot straight through their cloacas—such was their angst to run away. The stampede was thunderously impressive, and my vantage point was superb. I was right in the eye of the storm, so to speak. Seeing those terrified cattle bolt in sheer panic was good for a couple yuks—*until* the "cow dust" settled upon me. Those familiar with cow dust will tell you it is four parts dry dung, four parts dry urine, and two parts dust. I was snorting cow dust for the rest of the evening! One week later, I had both index fingers stuffed to the second knuckle joint up my nostrils, and I was *still* scoring cow dust crusties. I was no longer amused by the cattle on my plot. I no longer cared if they could be taught the "Mojave Moo." I just wanted them gone—*forever!*

With this in mind, I telephoned the agency in charge of my beloved 'Winder Spot. When I got their message machine, I left a voicemail describing what I was seeing out there. I was quite sure that this message would have all the effect of spitting in the Grand Canyon, but I felt better for having done it. Within minutes of leaving the phone message, I got a call back. When I again described the situation to the agent in charge, he told me

that there were no grazing permits issued for that patch of ground. Furthermore, even if permits had been released, they would have allowed for six cattle per section of land involved. Six cattle per section? Uh-nope, I assured the agent, the permitless allotment had been greatly exceeded. The phone call ended after I gave the agent directions to the 'Winder Spot.

Three days later, I was heading in that direction. Two miles from the 'Winder Spot, it was clear that some changes had been made. Before my phone call, the cow pies on the gravel road were so numerous that it was impossible to drive the road without hitting some. Some of those organic land mines were huge and fresh. When hit, they made a loud and sickening "splat," and sent little skittles of shit droplets all over the undercarriage. At times, my poor little TOT coma was crotch deep in the stuff. And now there was nothing to wallow in! There was nothing to the side of the road either. Had I just imagined it all? Nope! As I pulled into my parking spot, I noticed that a deep pit had been dug in the center of the corral. Within the framework of the pit lay two-plus years' worth of smoldering waste material from over 400 head of cattle. It was a big old pit full of genuine flaming bullshit!

I don't know what the agent said, I don't know what he did. I remain forever grateful, and mystified by the magnitude of what was accomplished in such a short time. In three days flat, 400 head of cattle disappeared, and at least six miles of dirt road were cleared of all fecal matter. It was all loaded into the pit—and burned. I'm thinking my agent must have called down some thunder!

In wrapping up this tale, I should mention that as these words are written, cattle are once again grazing the 'Winder Spot. But it does appear that the "six-per-section" rule is being followed to the letter of the law. While "zero-per-section" would be a better scenario, what I'm seeing now is much more tolerable. The cattle grazing here may be an inconvenience, but that situation is infinitely better than a housing development.

Epilogue

The preceding words are a refined version of what was sent to about 150 people who were on my personal Tucson Herpetological Society email list in June of 2006. The words elicited an avalanche of "You're full of it, Repp" type of responses from the many infidels in that group. But while everybody else was crucifying me, one person came through with a very interesting response. He apparently had a buddy who raised goats near the Big Bend area of Texas. This buddy would let him herp his property, and the goats would sometimes tag along when he went out. He worked with these goats, and taught them to bleat when they saw a snake! Either this is a case of the first liar doesn't stand a chance, or two very different situations that indicate maybe we herpers have some untapped resources at our disposal. As for me, I'd rather herp alone and find nothing than to herp with livestock of any kind and score big. Perhaps it's merely a matter of "I'd rather do it myself."

This here is Roger Repp, signing off from southern Arizona, where the turtles are strong, the snakes are handsome, and the lizards are way above average.

What You Missed at the August Meeting

John Archer
j-archer@sbcglobal.net

While my daughter was in college she had the pleasure of working with our August speaker and described her with the highest accolades. I admit that I still approached the meeting wondering if the speaker was going to be good, but Dr. Linda Yang lived up to my daughter's portrayal.

From her bio on our web site:

Dr. Linda Yang was born in Beijing, China, and immigrated to the US when she was two years old. She grew up around the Chicago-land area and earned her undergraduate degree at Washington University in St. Louis. Throughout undergrad, Dr. Yang volunteered regularly with the St. Louis Zoo as a research assistant and veterinary technician assistant, learning more about the care of zoo animals and wildlife populations. In 2009, Dr. Yang graduated with a major in Biology and a minor in Art. A year later, she entered veterinary school at the University of Illinois in Urbana-Champaign and graduated in 2014. During veterinary school, Dr. Yang was very active with the Wildlife Medical Clinic, a non-profit, student-run clinic dedicated to helping injured wildlife and educating the public about wildlife conservation. She was a manager for two years, gaining experience treating and handling multiple species of wild birds (including raptors), mammals, and reptiles. Some of her favorite patients included Gandalf the White Pelican, Qigiq the Snowy Owl, and Mo the Box Turtle.

Dr. Yang titled her talk, "Reproductive Disease in Reptiles (Sex Optional)." The optional sex was mentioned because she admitted that the breeders in our group probably know much more than she does about the sexual acts of reptiles. She deals with the consequences. I've already admitted that I'm not a breeder of animals (unless you wish to count my two children), but Dr. Yang covered topics that interested me even if I never breed an animal. She pointed out that females may have eggs even if they have never been with a male, so her talk was pertinent to all of us who keep reptiles.

She began with a disclaimer slide pointing out that nearly all of the images in her presentation belong to other people and that some were graphic and not suitable for young or more sensitive audience members. Not surprisingly, no one excused themselves.

We received a brief overview of the male and female reproductive systems and learned that only 20% of modern reptiles bear live young (either viviparous or ovoviviparous.) Then Dr. Yang moved into the problem of egg binding. Eggs might bind while developing in the ovaries but before they progress through the oviduct (follicular stasis), or after they have formed a shell and are sitting in the oviduct or cloaca (post-ovulatory stasis). Neat pictures illustrated both.

She listed possible causes, with the leading cause being husbandry problems including dehydration, calcium deficiency, malnutrition, inappropriate temperatures or inappropriate substrates. Diseases such as infection, cancer, or organ dysfunction such as renal disease might be causes. Or mechanical obstructions such as an enlarged or badly positioned egg, a narrow



Dr. Linda Yang. Photograph by Dick Buchholz.

pelvis, or even a tumor may block the eggs.

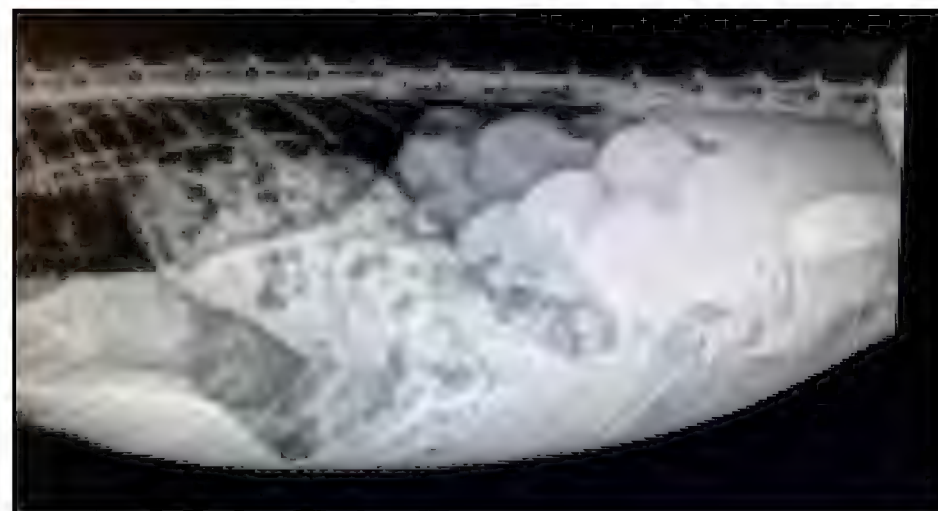
The three groups she sees most often with egg-binding problems are iguanas, chameleons, and bearded dragons, but it can occur in geckos, chelonians or even snakes.

Dr. Yang gave us clinical signs to observe in any reproductive female reptile. Normal signs would include decreased appetite, increased activity, digging, and a distended belly, but she cautioned that any of these could signal problems if they continue for an abnormally long period. If your animal suddenly becomes lethargic it's time to get it to a vet, but straining, prolonged lack of defecation, or prolonged distension of the coelom are also red flags.

A vet may use physical exams, radiographs, blood work, fecal analysis, ultrasounds, MRIs or CT scans to diagnose your animal. Cost and available equipment might determine what is used. Dr. Yang talked of a wide variety of treatments available depending on what the diagnosis indicated. She illustrated some of the options with those "graphic" but colorful, slides. She gave us some cautions and some possible complications with each treatment, again amply illustrated with colorful slides. One interesting problem is egg yolk coelomitis. An internet search will turn up some nice, or at least colorful, photos.

Males don't seem have as many reproductive complications as females. Dr Yang used only four slides for male problems, which include hemipenile plugs and penile prolapse. If caught fairly quickly, both are relatively easy to treat and generally have a good outcome, though the animal might be sterile after treatment.

Dr. Yang gave a nice overview of reproductive diseases and treatments. She had good illustrations and a well-organized presentation. As always, this article can't convey all of her talk or the discussions we had over dinner. You'll have to actually attend a meeting to get the full value of one of our speakers. I'm sorry you missed Dr. Yang.



Radiographs may be used to diagnose reproductive problems. A chameleon's follicles show up well here. X-ray by Linda Yang.

Herpetology 2017

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

MONGOOSE PREDATION ON ROCK IGUANAS

R. van Veen and B. S. Wilson [2017, The Herpetological Bulletin 27(2):201-216] note that the introduced small Asian mongoose (*Herpestes auropunctatus*) has been widely implicated in extirpations and extinctions of island taxa. Recent studies and anecdotal observations suggest that the nests of terrestrial island species are particularly vulnerable to mongoose predation, yet quantitative data have remained scarce, even for species long assumed to be at risk from the mongoose. The authors monitored nests of the Critically Endangered Jamaican Rock Iguana (*Cyclura collei*) to determine nest fate, and augmented these observations with motion-activated camera trap images to document the predatory behavior of the mongoose. The data provide direct, quantitative evidence of high nest predation pressure attributable to the mongoose, and together with reported high rates of predation on hatchling and juvenile iguanas (also by the mongoose), support the original conclusion that the mongoose was responsible for the apparent lack of recruitment and the aging structure of the small population that was "re-discovered" in 1990. However, the data also demonstrate a significant reduction in nest predation pressure within an experimental mongoose-removal area. Thus, results indicate that otherwise catastrophic levels of nest loss (at or near 100%) can be ameliorated or even eliminated by removal trapping of the mongoose. The authors suggest that such targeted control efforts could also prove useful in safeguarding other threatened insular species with reproductive strategies that are notably vulnerable to mongoose predation (e.g., the incubation of eggs on or underground).

SIDEWINDERS VERSUS KANGAROO RATS

M. D. Whitford et al. [2017, Animal Behaviour 130:73-78] note that many species perform complex antipredator displays that deter attacks by informing predators that continued attempts at prey capture will be costly. However, because of the difficulties in studying the behavior of free-ranging predators, we have a limited understanding of how predators respond to those signals. The authors took advantage of their ability to quantify predatory behaviors of free-ranging sidewinder rattlesnakes, *Crotalus cerastes*, to examine the influence of anti-snake behaviors performed by desert kangaroo rats, *Dipodomys deserti*. They recorded natural encounters and quantified the predator-deterrent behaviors displayed by the kangaroo rats, as well as any strikes performed by the rattlesnakes and whether the strikes were successful. They found that predator-deterrent signaling significantly reduced the probability that a rattlesnake would strike. This was most likely due to the ability of kangaroo rats to mobilize extremely rapid evasive leaps; even rats that appeared unaware of the snakes were almost always able to avoid strikes. The degree of effectiveness of this evasive leaping in countering rattlesnake predation was unexpected and indicates that this may be a rich system for exploring the biomechanics of extreme physical performance in a naturalistic context.

PLETHODONTID SPECIES RICHNESS

K. H. Kozak [2017, Herpetologica 73(3):220-228] notes that plethodontid salamanders have become model organisms for studying many fundamental questions in evolutionary biology, ecology, and behavior. Dozens of studies focused on geographic patterns of phenotypic and genetic variation have been conducted on plethodontids, such that we now have a deep understanding of how many species are in the family and where they occur. This body of work has been foundational to exploring the drivers of the major patterns of species richness in the family. Approximately 70% of the world's 696 extant species of salamanders are plethodontids. Most plethodontids are concentrated into two hotspots of diversity, the Appalachian Highlands and the Mesoamerican Highlands. Moreover, within these montane centers of diversity more species are found in midelevation habitats than at the highest or lowest elevations. The clade has been highly successful in the New World tropics, which harbors more plethodontid species than the temperate zone. This paper reviews new insights on the evolutionary and ecological causes of variation in plethodontid species richness over geographic space and evolutionary time. New hypotheses on the phylogenetic relationships of plethodontids and tools from comparative phylogenetics and biodiversity informatics have been critical to this recent progress. Threats to plethodontid diversity arising from global climate change are examined, as is the need to further study and cross-validate forecasts of species' range dynamics with different modeling approaches and independent data.

MATE CHOICE IN YELLOW-BELLIED TOADS

H. Cayuela et al. [2017, Animal Behaviour 130:251-261] note that a "compatible genes" model has been put forward to explain female mating decisions. According to this model, females are assumed to increase the genetic quality of their offspring by choosing mates on the basis of interactions between maternal and paternal genomes. Yet, this model is mainly supported by empirical data in endotherm vertebrates. Few studies have investigated this issue in terrestrial ectotherms like amphibians. These organisms often live in spatially structured populations characterized by small subpopulations and a high degree of philopatry, leading to striking reduction in gene flow, high genetic drift and relatively high inbreeding levels. In such a situation, one might expect that natural selection should favor mating tactics limiting the risk of inbreeding depression. Using an experimental approach controlling for the reproductive state of males, the authors examined how genetic compatibility may affect mating behavior in the yellow-bellied toad, *Bombina variegata*. First analyses confirmed a high degree of inbreeding in the studied population. Yet, the authors did not find any mating tactic that reduced the risk of inbreeding depression. Contrary to expectations, males more closely related to the female had the higher mating success. The ecological and evolutionary implications of these results are discussed.

Minutes of the CHS Board Meeting, August 18, 2017

Rich Crowley called the meeting to order at 7:38 P.M. Board members Dan Bavirsha, John Bellah, Lisette Chapa, Morgan Lantz and Jessica Wadleigh were absent. The minutes of the July 14 board meeting were read and accepted.

Officers' Reports

Treasurer: Andy Malawy read through the financial report.

Membership secretary: Mike Dloogatch read the list of expiring memberships. Consensus of the board was that renewal reminders should be sent out by email in addition to regular mail.

Sergeant-at-arms: Attendance at the July 26 general meeting was 30.

Old Business

Adoptions: Linda Malawy listed the animals she is currently trying to find homes for.

Nominating committee: Kim Klisiak and Mike Scott reported that they have at least one candidate for all board positions. The committee is still searching for additional candidates.

Library: Mike Dloogatch reported that Joan Moore is interested in serving as librarian. Teresa Savino has made it known that she wishes to step down from that position.

New Business

It was suggested that the lunch room at the Notebaert might be better suited for the CHS general meetings than the usual second-floor venue. John Archer will check with Celeste Troon about the possibility.

Mike Dloogatch reported that downstate member John Palis has a scanner and is interested in scanning in several years' worth of old *Bulletins* to be posted on our website. Mike and John will investigate costs and come up with a proposal for the board.

Mike Dloogatch moved to allocate \$125 for CHS picnic expense. Gail Oomens seconded. After some discussion, Mike amended the motion to allocate up to \$250. Gail Oomens seconded the amended motion, which passed unanimously.

The meeting adjourned at 9:30 P.M.

Respectfully submitted by recording secretary Gail Oomens

Advertisements

For sale: **highest quality frozen rodents.** I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , \$25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), \$27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm) , \$30/100; Large fuzzy mice /hoppers (10 to 12 days old—8 to 10 gm), \$35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale or trade: Probable pair of albino Harquahala rosy boas. They were born in my home in late 2016 and are feeding on f/t peach fuzz mice. Pure locality animals exhibiting a recessive gene. Viewing is possible, parents on site. I can drive to meet a reasonable distance, or ship if you are not local. Discount if you pick them up from my home. Cash, credit card or PayPal. Call or text 510-318-1715, or email elenabmoss@gmail.com.

Herp tours: **Costa Rica herping adventures.** Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site <http://hiss-n-things.com> and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Line ads in this publication are run free for CHS members — \$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.

NEW CHS MEMBERS THIS MONTH

Stella Larson
Karen TerMaat
Guy Warner

Linda Yang
Benjamin Sebastian
Cliff Summers

From the company that developed the **first UVB lamp** for reptiles 20 years ago...

T5 HO UVB



NEW

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News and Announcements

SHOW SCHEDULE

In addition to ReptileFest the Chicago Herpetological Society puts on many live animal displays throughout the year. The events now scheduled for April through July are listed below. CHS members who wish to participate in an event should call or text ahead to Show Coordinator Dick Buchholz, 805-296-9516, to confirm.

- Notebaert Nature Museum, first full weekend of each month, Saturday and Sunday, 10 A.M. – 3 P.M.
- All Animal Expo, first Saturday & third Sunday of each month, 10 A.M. – 3 P.M., Dupage County Fairgrounds, Wheaton.
- Glen Ellyn Library, 110th Anniversary, October 14, Evening for adults only.
- Chicago Pet Show, November 11–12, 10 A.M. – 5 P.M., Kane County Fairgrounds, 525 S Randall Rd., St. Charles.

2017 Midwest Herpetological Symposium

October 20, 21, and 22, 2017



Hosted by the

MINNESOTA HERPETOLOGICAL SOCIETY

The event will be held at:

Best Western Hotel

1901 Killebrew Dr, Bloomington, MN 55425

Phone: (952) 854-8200

(just a block from Mall of America!)

SPEAKERS

FRIDAY NIGHT ICE-BREAKER

Dav Kaufman & Jeff LeClere – Field Herpetologists
Herpers, Herpers 2, and Herpers 3 DVDs

SATURDAY PRESENTATIONS

Michael Starkey – Save the Frogs; International Events Coordinator – “The Amphibian Extinction Crisis; Current threats facing amphibians and what you can do about it”

Matt Goode PhD – Viper Institute; School Nat Resources and Environment, U of Arizona
“Ecology and Conservation of King Cobras in India and Southeast Asia”

Anne Stengle PhD Candidate – University of Massachusetts
“Shake Rattle and Roll, From Snake Fungal Disease to the Quabbin Rattlesnake Introduction”

Barney Oldfield DVM – Crotophytus Photographer, Hesperus, Colorado – “Crotophytology”

Michael Ogle – Curator; Department of Archelosaurs & Lepidosaur, Zoo Knoxville
Chelonian Captive Breeding Techniques

KEYNOTE PRESENTATION

Whit Gibbons PhD – Professor Emeritus of Ecology, University of Georgia – “Their Blood Runs Cold: Adventures with Reptiles and Amphibians”

- 
- *Ice Breaker*
 - *Speakers*
 - *Videos*
 - *Photography*
 - *Hospitality Room*
 - *Auction*
 - *Banquet*
 - *Vendors*
 - *Live Reptile Display*
 - *and more!*

COME FOR THE TALKS –
STAY FOR THE FUN.
HOPE TO SEE you!



Registration forms at:

<https://mnherpsoc.org/midwest-herpetological-symposium>

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, September 27, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Leroy Walston**, an ecologist with the Environmental Science Division of Argonne National Laboratory, will speak about his studies of reptiles such as ornate box turtles, eastern hog-nosed snakes and desert tortoises on U.S. Air Force bases.

At the October 25 meeting, **Chris Pellecchia**, a Ph.D. candidate at Southern Mississippi University, will speak about the endangered rock iguanas of the Dominican Republic.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

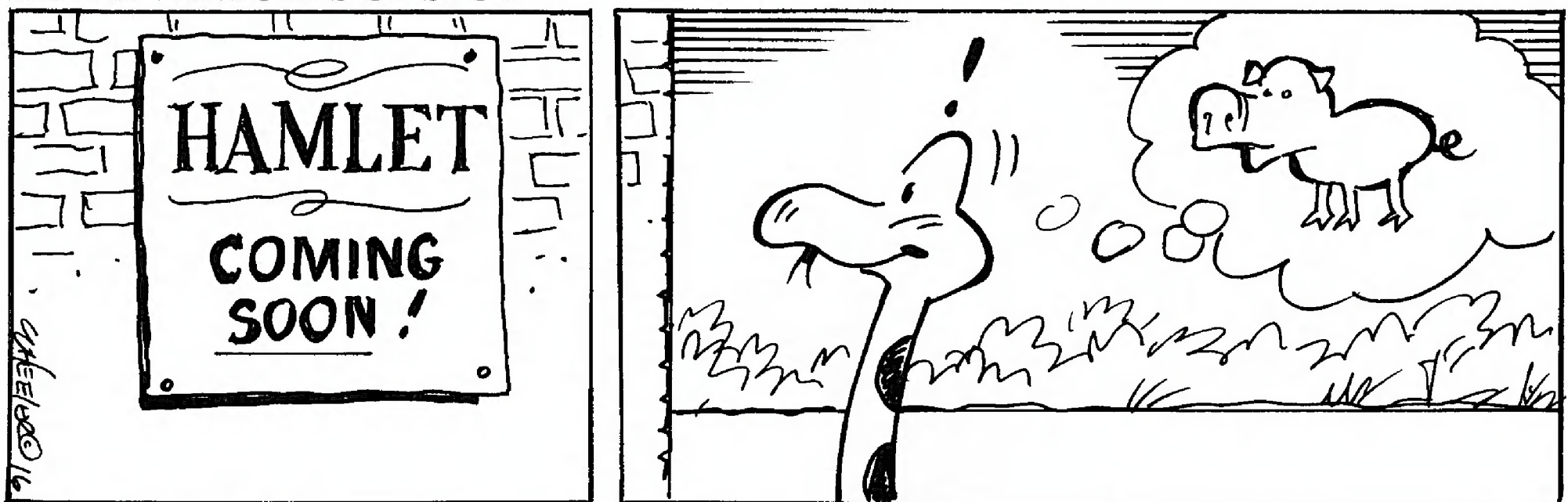
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., Friday, October 13, 2017, at the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

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